FOREST INSECT CONDITIONS

ON THE

BRIDGER NATIONAL FOREST, 1970

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This is a report of the most important forest insect problems on the Forest during 1970. Material for this report was compiled from aerial survey data, from past evaluation reports, from periodic on-the-ground investigations, and finally, from permanent trend plots.

Briefly, the most important insect problem continues to be the mountain pine beetle in lodgepole pine. Epidemic conditions exist in both Divisions with no immediate relief in sight. Tree killing, generally, has decreased in most of the older infestations but increased elsewhere. Beetle populations continue to move south into previously uninfested areas in both the Wyoming and Bridger Divisions. The only practical alternative to control now is to log in and ahead of the active infestations, to salvage infested trees and those ultimately threatened, and to provide long-term protection by converting these stands to a less suceptible state.

Defoliation of Douglas-fir and true firs by the spruce budworm continued for the sixth consecutive year in the Wyoming Division but damage was mostly light to moderate. No increase is predicted in 1971. A more complete discussion of these insect problems follows.

Mountain pine beetle, Dendroctonus ponderosae Hopk.

The mountain pine beetle in lodgepole pine continues to be the most important insect problem on the forest today. Well established infestations continue to deplete lodgepole stands in both the Wyoming and Bridger Divisions. A discussion of the situation in each Division follows:

Wyoming Division

The Greys River portion of the Wyoming Division has a long history of mountain pine beetle activity. The current infestation had its beginning in 1962 when several hundred "faders" were reported in Poison Hollow and Little Greys River. Since then, tree killing has increased in both area and intensity until most of the merchantable lodgepole stands have either been seriously depleted, are under attack, or immediately threatened. The infestation has continued to spread throughout the tributaries of the Greys River from low to high elevations and along the Greys River proper from north to south. Current attacked trees were found as far south as Spring Creek. A summary of evaluation data taken in a few infested areas in the upper part of the Greys River follows:

Division	Area	No. Attacks In 1970	No. Attacks In 1969	Buildup Ratio	Ave. d.b.h.[1] 1970	Ave. d.b.h.[1] 1969	Infes.[2] Intensity	Trend
Wyoming	Blind Bull	16	36	0.4:1	11.1	11.4	M	Decreasing
	Trail Creek	4	9	--[3]	9.5	13.3	L	
	Forest Park #1	26	47	0.5:1	11.7	12.2	M	Decreasing
	Forest Park #2	56	103	0.5:1	12.8	12.4	M	Decreasing
	Elk Creek	9	19		14.2	13.1	L	
	Red Creek		17			10.7	M	

1/ Weighted Average

2/ L=Light; M=Medium; H=Heavy

3/ Counts were too few to provide an estimate of a buildup ratio or trend.

In several areas it was difficult to find a sufficient number of trees to calculate a sound buildup ratio. In areas where counts were relatively high, such as Blind Bull and Forest Park, the number of 1969 attacks exceeded the 1970 attacks, indicating a downward trend. This decline is due chiefly to a lack of suitable host material. As will be shown later, most of the stands sampled, generally, are of small diameter and are incapable of sustaining the heavy losses that are occurring in parts of the Bridger Division.

In order to gain some understanding of the type of stands under attack, very limited cruise data was obtained along the east side of the upper Greys River and in one area in Little Greys River. These data are summarized in Figures 3-6 in the appendix. They show, generally, that at this time, very little mortality has occurred and that the remaining green stand structure is not conducive to heavy beetle buildup. Experience has shown that, other factors being equal, stands containing a preponderance of large diameter trees will suffer the heaviest losses. Of the four stands sampled, the one near Waterdog Lake exhibits the best potential for sustaining increased bark beetle activity. Many of these relatively small diameter stands, however, will continue to incur losses, but they will not be catastrophic.

In contrast to the rather optimistic trend data in a few areas, the infestations in the Greys and Little Greys Rivers are far from over. In the Little Greys River and its upper tributaries, barring unforseen natural factors, tree killing will continue to increase, reach a peak level in 1971, then begin to subside. Widely scattered mortality will continue in Bailey and West Bailey Creeks and increased activity can be expected along the south bench of the Snake River.

In Greys River proper, particularly in the lower stretches, from a point near White Creek north to the confluence of the Little Greys River, tree killing will be static to decreasing. To the south, however, mountain

pine beetle attacks will increase in most areas and will continue to push south along the bottom of the Greys River and onto the bench between Bear and North Crow Creeks. A high level of tree killing will continue in all of the tributaries on the east side of the Greys River between Deadman Creek in the north to Marten Creek in the south. In most of these short, steep drainages, beetle populations have already begun to deplete their food supply at low elevations and continue to push higher into less favorable host type. However, there is still a sufficient number of host trees in most of these areas to maintain high beetle populations and subsequent tree killing for several years.

The area exhibiting optimum potential for increasing mountain pine beetle activity is along the large bench on the west side of the river between Bear Creek and North Crow Creek. Although these stands contain mixed type and have a scattering of age and size classes, they nonetheless contain a sufficient number of lodgepole pine of large diameter to not only nurture an endemic population into an epidemic one, but sustain an infestation for several years. At this time, tree killing is widely scattered but the pattern of mortality has changed from individual trees to groups of 20 to 30 trees which is one characteristic of an increasing trend. The largest concentration of these large tree groups is between Bear and Elk Creeks.

Along the eastern Slope of the Wyoming Range, the situation is considerably more optimistic. Widely separated mountain pine beetle mortality was recorded in the lower reaches of South Piney and Cottonwood Creeks and in limber pine at high elevations, but they show no potential for increase.

The long-standing infestation in the north and south forks of Middle Beaver Creek continued to decline. Static conditions prevail in Chall Creek and its tributaries.

Bridger Division

Since the first group of faded trees was detected in 1961 in Green River Lake Campground, beetle populations have continued to increase and now extend throughout the entire range of lodgepole pine on the Bridger Division. The infestation continues to increase in both intensity and extent wherever host trees are available. Infested trees were recorded as far north as Dollar Lake and as far south as East Sweetwater River. The heaviest concentration of infested trees remains between New Fork and Boulder Lakes. In most of these areas the long-standing infestations along the Forest boundary are declining, but they continue to perpetuate themselves by pushing into uninfested areas near and into the Wilderness. In some areas, such as Trapper and Bridger Creeks and Lovatt Lake, they are well established in the Wilderness.

The single most significant increase in tree killing during the last two years has been in the south. Widely separated tree mortality has been

occurring in the fringe areas along the Forest boundary for the past three to four years that failed to match the progress of the infestations to the north. During the last two years, however, the character of these southern most infestations have changed from widely scattered individual trees and small tree groups to relatively large, well defined groups of 10 to 20 trees. Some of this buildup is on private land, but most is on or just within the Forest boundary. A summary of survey data taken in some of the suspect buildup areas follows:

Division		No. Attacks in 1970	No. Attacks in 1969	Buildup Ratio	Ave. d.b.h.1/ 1970	Ave. d.b.h.1/ 1969	Infes.2/ Intensity	Trend
Bridger	E. Sweetwater	74	54	1.4:1	13.4	11.6	M	Increasing
	Little Sweetwater #1	20	15	1.3:1	10.4	10.4	L	Increasing
	Little Sweetwater #2		3 3/			7.3	L	
	Sage Meadow	1	14			11.0	L	
	Clear Creek	21	17	1:1	11.7	11.9	L	Increasing
	Station Creek	4	15		12.8	9.9	L	
	Squaw Creek		9			12.1	L	
	Big Sandy Creek						L	

1/ Weighted Average

2/ L=Light; M=Medium; H=Heavy

3/ Counts were too few to provide an estimate of a buildup ratio or trend.

As is the case with newly developing infestations, it is difficult to detect and record a sufficient number of newly dead and infested trees to constitute a meaningful sample. The exceptions are East Sweetwater and possibly Little Sweetwater and Clear Creek where trees were found and where, in each case, the number of new attacks exceeded the old ones. This ground examination coupled with successive years of aerial survey trend data indicates an increase in bark beetle populations and subsequent tree killing in 1971. The pattern of tree killing will be similar to that occurring in the north. The infestations will intensify at the low elevations and continue to move into uninfested timber near the Wilderness boundary. Heaviest mortality will occur at the low elevations. The overall intensity of the infestation and subsequent degree of tree killing will depend largely on stand structure; i.e., those stands containing many large diameter trees will sustain the heaviest losses. Some areas such as those in Little Sweetwater River that contain pole size stands will not be directly affected. Most of the areas, however, contain a sufficient number of large trees to nurture and sustain an infestation for several years.

Insect broods were plentiful in all of the trees examined in both Divisions. Brood stage varied with aspect and elevation. In the lower exposed areas medium size larvae prevailed, while in the higher, sheltered climes, a few eggs, egg galleries, and egg laying adults were found. The adults will overwinter and resume egg laying next spring. Parasite and predator populations were present, but they were not sufficient to offset the increasing trend. They have had little, if any, controlling influence in the past, and there is no reason to suspect that they will have a beneficial influence in the future.

Control recommendations remain essentially the same as last year, i.e., there are only two practical alternatives: The first is to log in and ahead of the infestations whenever there is an opportunity; the second alternative is to do nothing and let nature take its course. Cruise data taken last year in the Bridger Division showed that in some areas where the infestations had run their normal course, almost 50 percent of the stand 5.0 inches and above were killed. These were extremes; most likely overall mortality will range between 25 and 35 percent. In all cases, however, a large proportion of the larger trees will be ultimately killed.

Spruce budworm (western form), Choristoneura occidentalis Free.

This is the sixth consecutive year of noticeable spruce budworm defoliation of Douglas-fir and true fir on the Forest. The infestation boundaries remain in the lower reaches of the Greys River, along both sides of the Snake River, in Bailey and West Bailey Creeks, and in Little Greys River. Additional but less extensive defoliation was also recorded on adjacent Targhee and Teton National Forests. A chronological listing of defoliation by damage classes on the Bridger Forest as mapped during aerial surveys follows:

Text Table 3
Defoliation Intensity

Year	Light (acres)	Medium (acres)	Heavy (acres)	Total (acres)
1965	10,000			10,000
1966	33,000	800		33,800
1967	19,500	30,700	1,600	51,800
1968	33,300	53,000	8,900	95,200
1969	69,800	3,000		72,800
1970	46,800	9,000		55,800

After the infestation was detected in 1965, it increased in both area and intensity, reached a peak in 1968 and has been on the decline since. What is significant this year and last is the complete absence of heavy defoliation. A tabulation of on-the-ground defoliation measurements compared with last year's estimates and predictions of budworm activity for 1971 follows:

Text Table 4

Location	1970 Defoliation Predicted[1/] (Percent)	1970 Defoliation Actual (Percent)	1970 Egg Masses per 30" Branch (Number)	1971 Defoliation Predicted Class (Percent)	
'ley Cr.	51-90	6	3	< 15	Light
Porcupine	51-90	30	32	51-90	Heavy
Squaw Cr.	51-90	40	18	25-50	Moderate
Roos Cr.	90-100	55	130	90-100	Heavy
Black Canyon	15-25	10	15	25-50	Moderate
Bull Hollow	51-90	13	14	15-25	Light

1/ Predicted in 1969

It is apparent from this table that actual defoliation, as measured directly from sample trees, fell short of that predicted in 1969. During the life of this infestation, existing prediction tables based on fall egg mass counts in one year have consistently underestimated the level of defoliation the following year. This difference has also been consistent from year to year in other infestations in the Region. Data is now available, however, to indicate with some certainty a direct relationship between the number of egg masses per unit area and subsequent defoliation. There are other variables involved, such as the size of egg masses, the number of eggs per mass, the age of infestation, and possibly its location, that must be considered before the existing prediction method is modified. There are sufficient data available now to develop new prediction tables, but they will not be forthcoming until 1971 at the earliest. Until then, existing defoliation prediction classes will remain in effect.

At this time no areas are under stress from heavy budworm feeding. Trees in some areas have sustained some degree of defoliation for six consecutive years but have yet to exhibit serious damage. Some widely scattered top and branch kill of Douglas-fir occurred in very localized areas in parts of Roos and Pine Creeks, but elsewhere, no permanent damage, other than probable growth loss, has been observed. Egg mass data do not indicate any significant change in budworm populations during 1971. Defoliation will continue at approximately the same level as in 1970 with little change expected in infestation boundaries. Control is not recommended.

A P P E N D I X

Impact and trend of the mountain pine beetle on stand structure.

Four years ago a study was initiated in Yellowstone National Park to determine the trend of the mountain pine beetle and its impact on stand structure in an untreated infestation. By systematic, annual measurements, it is possible to record the length of infestation, the beetles preference for tree size during the infestation cycle and most important, the ultimate impact on stand structure. Realizing that these findings might apply to only that area and none other, a second study area with far different stand characteristics was established near Spring Creek Park on the Bridger Division of the Bridger National Forest. The layout of the study area differs slightly from that in Yellowstone--because of stand configuration--but the mechanics of data collecting are identical.

Eighty-five permanent variable plots were established in a systematic grid pattern at seven chain intervals in the study area. The study area, rectangular in shape, covers approximately 350 acres. In June of 1970 when the plots were established, green stand data was taken in every other plot (BAF 10-26 plots) and mortality of lodgepole and limber pine was recorded on all 85 plots (BAF 5). At that time, counts were made of the brood trees (1969 attacks), faders (1968 attacks) and previous mortality (1967 and before). A followup survey was made in the fall to correct any mistakes made during the spring survey and to record the 1970 attacks. All dead trees were blazed and marked with the year of attack. Similar surveys will be made each year until the infestation subsides.

The findings to date are summarized in Tables 1-3 and Figures 1 and 2. Briefly, the stand is predominantly lodgepole pine (84 percent) with some limber pine (8 percent), Douglas-fir (6 percent) and lesser amounts of Engelmann spruce and subalpine fir (2 percent). As of 1967 accumulated mortality of lodgepole and limber pine was 2.22 percent. Since then, mortality has increased at a consistent rate from 1.21 percent in 1968, 2.07 percent in 1969, to 2.92 percent in 1970. At this time 8.42 percent of the susceptible lodgepole and limber pine has been killed by the mountain pine beetle. It is evident from the tables and figures that the larger trees are killed first at a level disproportionate to their occurrence in the stand. Interestingly, mortality of both lodgepole and limber pine is roughly proportional to their occurrence in the stand (approximately 9.6 percent). There appears to be sufficient host material of large diameter to support an increase in the rate of tree killing for two, possibly three, years.

TABLE 1. Mountain Pine Beetle Caused Mortality in Lodgepole Pine By Year and Diameter Class in Spring Creek Park, Bridger National Forest.

	Trees Per Acre by Diameter Class								
	6	8	10	12	14	16	>16	Total	% of Stand
Original Green Stand	33.72	49.92	39.48	41.05	29.94	15.39	10.84	220.34	84.0
Mortality Prior to 1968	0.30	0.34	0.65	1.20	1.10	1.09	0.93	5.61	2.2
Remaining Green Stand	33.42	49.58	38.83	39.85	28.84	14.30	9.91	214.73	81.8
1968 Mortality	--	--	0.32	0.60	0.50	0.38	0.50	2.30	0.9
Remaining Green Stand	33.42	49.58	38.51	39.25	28.34	13.92	9.41	212.43	80.9
1969 Mortality	--	--	0.43	1.05	1.71	0.97	0.70	4.86	1.8
Remaining Green Stand	33.42	49.58	38.08	38.20	26.63	12.95	8.71	207.57	79.1
1970 Mortality	--	0.33	0.32	1.72	2.15	1.22	1.30	7.04	2.7
Remaining Green Stand	33.42	49.25	37.76	36.48	24.48	11.73	7.41	200.53	76.4

TABLE 2. Mountain Pine Beetle Caused Mortality in Limber Pine By Year and Diameter Class in Spring Creek Park, Bridger National Forest.

	Trees Per Acre by Diameter Class								
	6	8	10	12	14	16	>16	Total	% of Stand
Original Green Stand	--	8.22	5.75	2.48	1.67	1.42	1.54	21.08	8.0
Mortality Prior to 1968	--	--	--	--	0.06	--	0.03	0.09	0.02
Remaining Green Stand	--	8.22	5.75	2.48	1.61	1.42	1.51	20.99	7.98
1968 Mortality	--	0.51	--	0.22	--	0.04	0.07	0.84	0.31
Remaining Green Stand	--	7.71	5.75	2.26	1.61	1.38	1.44	20.15	7.67
1969 Mortality	--	--	0.11	0.30	0.17	--	0.13	0.71	0.27
Remaining Green Stand	--	7.71	5.64	1.96	1.44	1.38	1.31	19.44	7.40
1970 Mortality	--	--	0.11	--	0.11	0.17	0.20	0.59	0.22
Remaining Green Stand	--	7.71	5.53	1.96	1.33	1.21	1.11	18.85	7.18

TABLE 3. Green Stand Structure by Diameter Class Prior To Tree Mortality Caused by the Present Mountain Pine Beetle Infestation in Spring Creek Park, Bridger National Forest.

	Tree Species					
Diameter Class (In.)	Lodgepole	Limber	Douglas-fir	Subalpine fir	Engelmann Spruce	Total
6	33.72		9.83		1.97	45.54
8	49.92	8.22	1.10		1.10	60.34
10	39.48	5.75	3.53	0.71		49.47
12	41.05	2.45				43.53
14	29.94	1.67	0.72	0.36	0.36	33.05
16	15.39	1.42				16.81
>16	10.84	1.54	0.44		0.87	13.69
Total	220.34	21.08	15.62	1.07	4.30	262.41
Percent of Stand	84.0	8.0	6.0	0.4	1.6	100.0

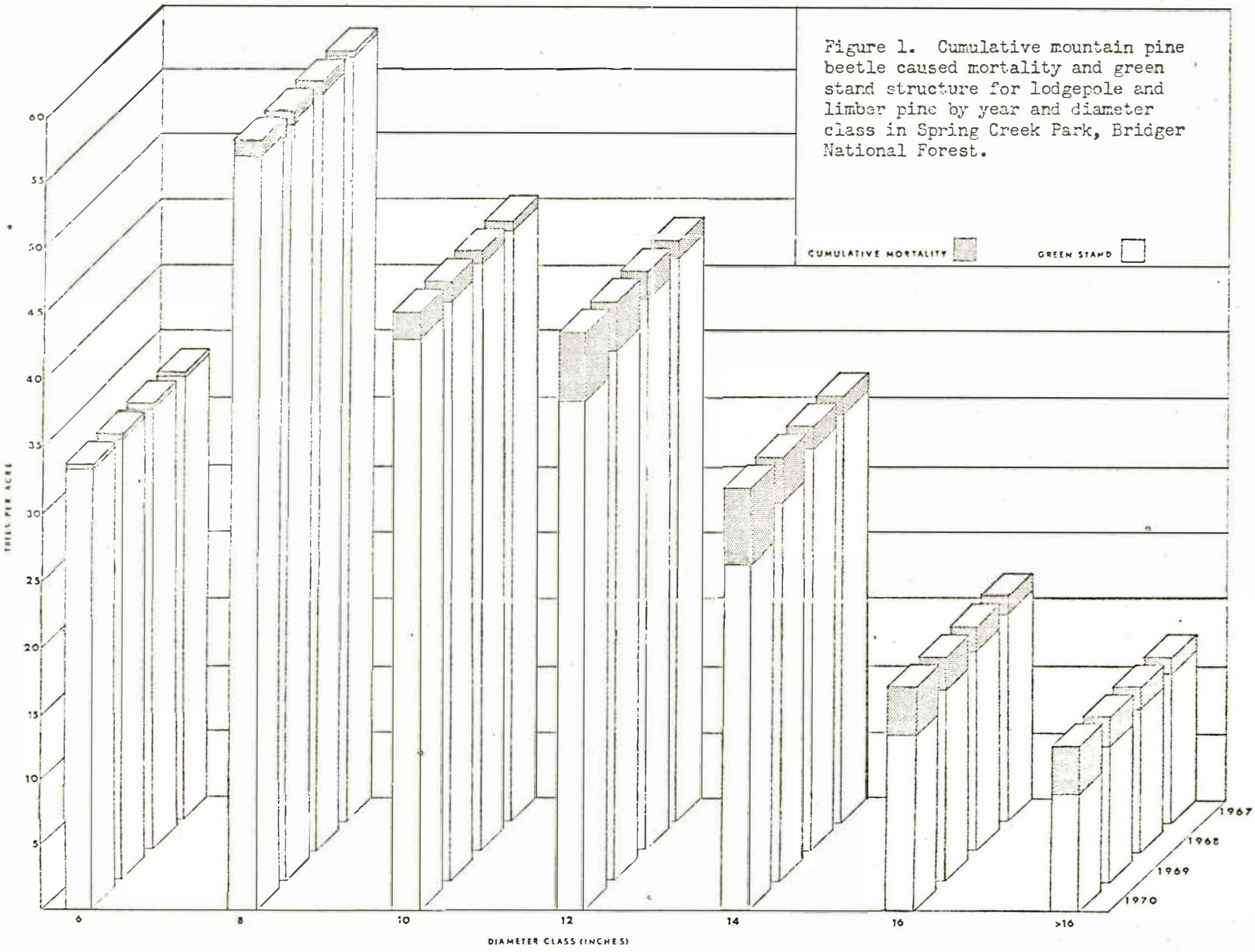

Figure 1. Cumulative mountain pine beetle caused mortality and green stand structure for lodgepole and limber pine by year and diameter class in Spring Creek Park, Bridger National Forest.

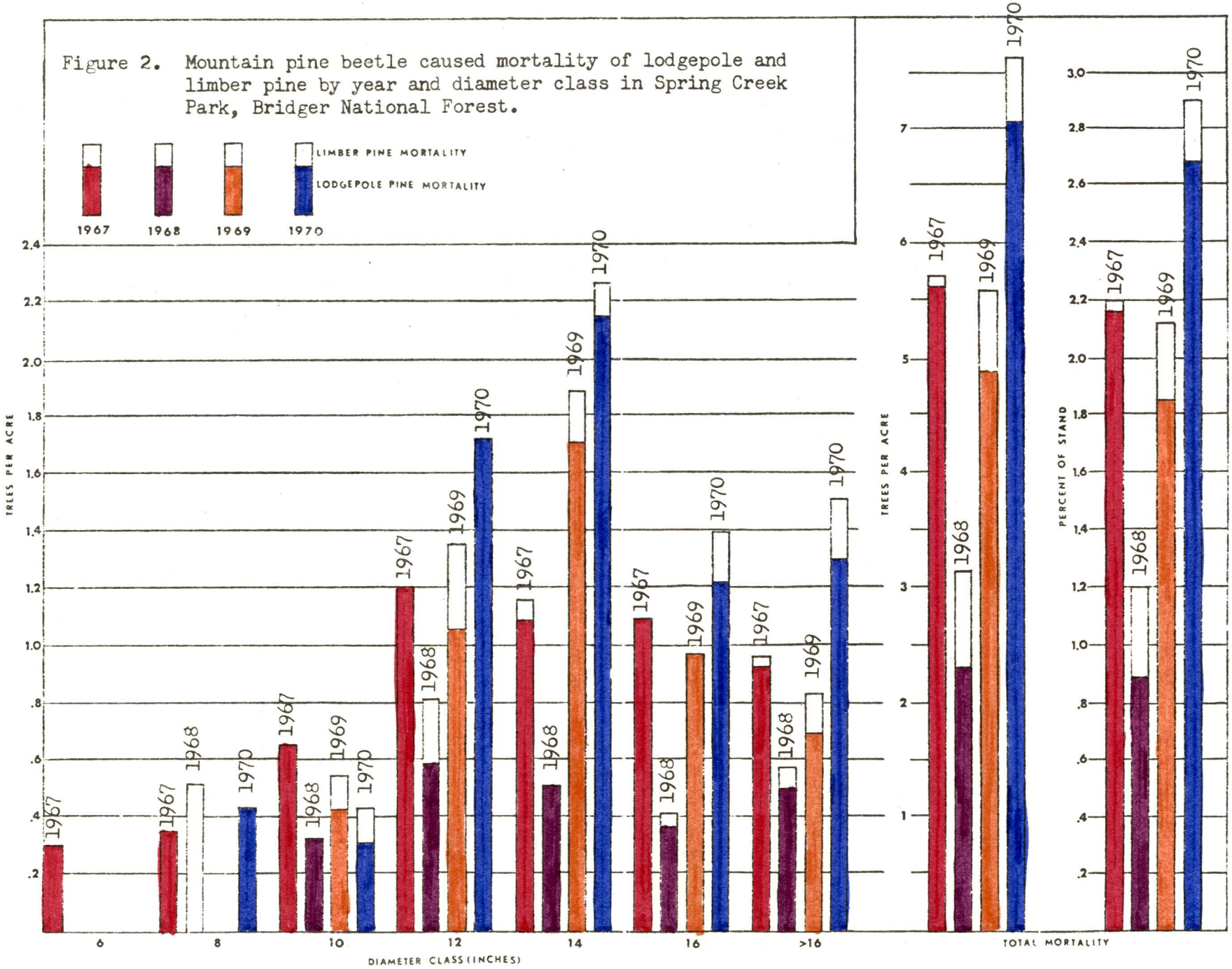

Figure 2. Mountain pine beetle caused mortality of lodgepole and limber pine by year and diameter class in Spring Creek Park, Bridger National Forest.

Figure 3 . Graphic and statistical presentation of stand structure in several areas on the Bridger National Forest, 1970.

Area	Diameter Class (In.)	Trees Per Acre: Live (No.)	Lpp (%) 1/	Dead Lpp. (No.)	Dead Lpp. (%) 1/	Live Other 2/ (No.)	Live Other 2/ (%) 1/	Total All Spp. (No.)	Total All Spp. (%) 1/
Sheep Creek	6	112.5	33.5	--	--	37.5	11.2	150.0	44.7
	8	98.0	29.2	2.8	0.8	4.2	1.3	105.0	31.3
Basal Area/Acre (Ft.^{2})	10	48.6	14.5	1.8	0.5	4.5	1.3	54.9	16.3
Live Lpp. 105.0	12	13.8	4.1	--	--	1.8	0.5	15.6	4.6
Dead Lpp. 2.5									
Other Spp. 2/ 17.5	14	5.0	1.5	0.5	0.1	1.0	0.3	6.5	1.9
Total 125.0	16	1.6	0.5	--	--	--	--	1.6	0.5
	>16	0.3	0.1	--	--	2.1	0.6	2.4	0.7
SE ± 3/ 6.7									
Total		279.8	83.4	5.1	1.4	51.1	15.2	336.0	100.0

1/ Percent of total stand
2/ Douglas-fir, subalpine fir
3/ One standard deviation

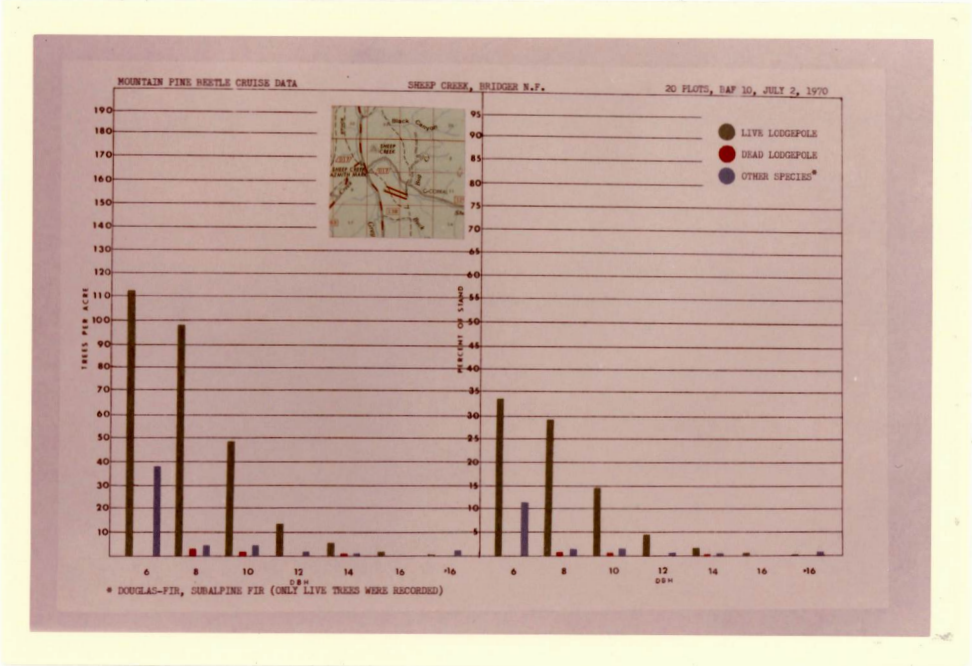

Figure 4 . Graphic and statistical presentation of stand structure in several areas on the Bridger National Forest, 1970.

Area	Diameter Class (In.)	Trees Per Acre: Live Lpp. (No.)	Live Lpp. (%) 1/	Dead Lpp. (No.)	Dead Lpp. (%) 1/	Live Other 2/ (No.)	Live Other 2/ (%) 1/	Total All Spp. (No.)	Total All Spp. (%) 1/
North Twin Creek	6	173.4	55.3	--	--	3.4	1.0	176.8	56.3
	8	87.4	27.9	5.5	1.8	--	--	92.9	29.7
Basal Area/Acre ($Ft.^2$)	10	24.0	7.7	8.4	2.7	3.6	1.1	36.0	11.5
Live Lpp. 82.7	12	3.2	1.0	--	--	0.8	0.3	4.0	1.3
Dead Lpp. 8.7									
Other Spp. 2/ 3.3	14	1.8	0.6	1.8	0.6	--	--	3.6	1.2
Total 94.7	16	--	--	--	--	--	--	--	--
	>16	--	--	--	--	--	--	--	--
SE % 3/ 7.4									
Total		289.8	92.5	15.7	5.1	7.8	2.4	313.3	100.0

1/ Percent of total stand
2/ Douglas-fir
3/ One standard deviation

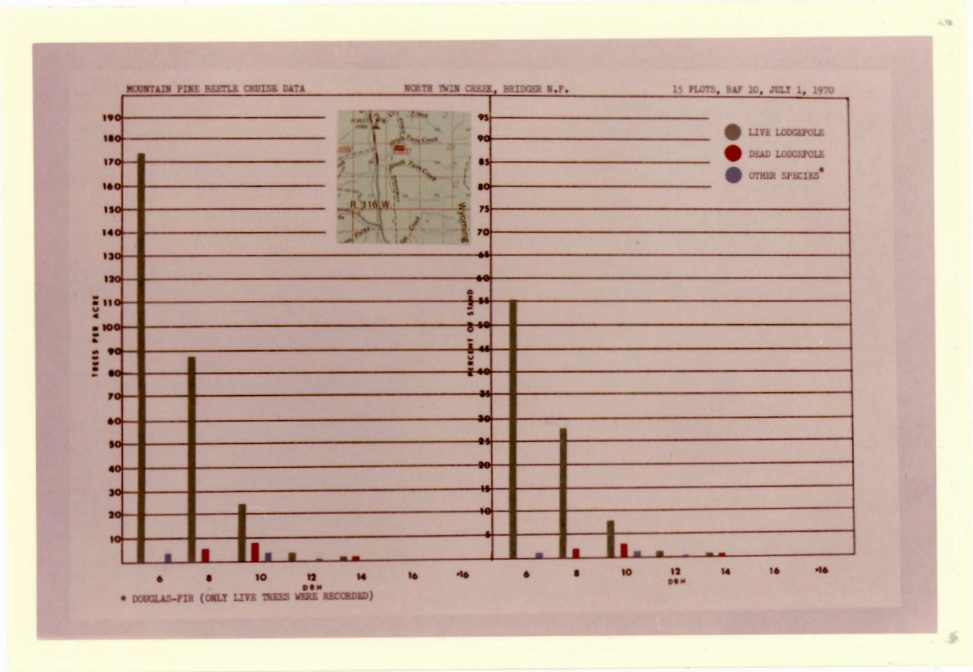

Figure 5 . Graphic and statistical presentation of stand structure in several areas on the Bridger National Forest, 1970.

Area	Diameter Class (In.)	Trees Per Acre: Live Lpp. (No.)	Live Lpp. (%)[1]	Dead Lpp. (No.)	Dead Lpp. (%)[1]	Live Other[2] (No.)	Live Other[2] (%)[1]	Total All Spp. (No.)	Total All Spp. (%)[1]
Park Creek	6	171.7	48.2	--	--	--	--	171.7	48.2
	8	124.0	34.8	4.0	1.1	1.0	0.3	129.0	36.2
Basal Area/Acre ($Ft.^2$)	10	39.0	11.0	3.0	0.8	0.6	0.2	42.6	12.0
Live Lpp. 104.7	12	5.6	1.6	1.2	0.3	--	--	6.8	1.9
Dead Lpp. 7.7									
Other Spp.[2] 0.7	14	2.7	0.8	1.8	0.5	--	--	4.5	1.3
Total 113.1	16	0.2	0.1	1.0	0.3	--	--	1.2	0.4
	> 16	--	--	--	--	--	--	--	--
SE %[3] 5.4									
Total		343.2	96.5	11.0	3.0	1.6	0.5	355.8	100.0

1/ Percent of total stand
2/ Douglas-fir
3/ One standard deviation

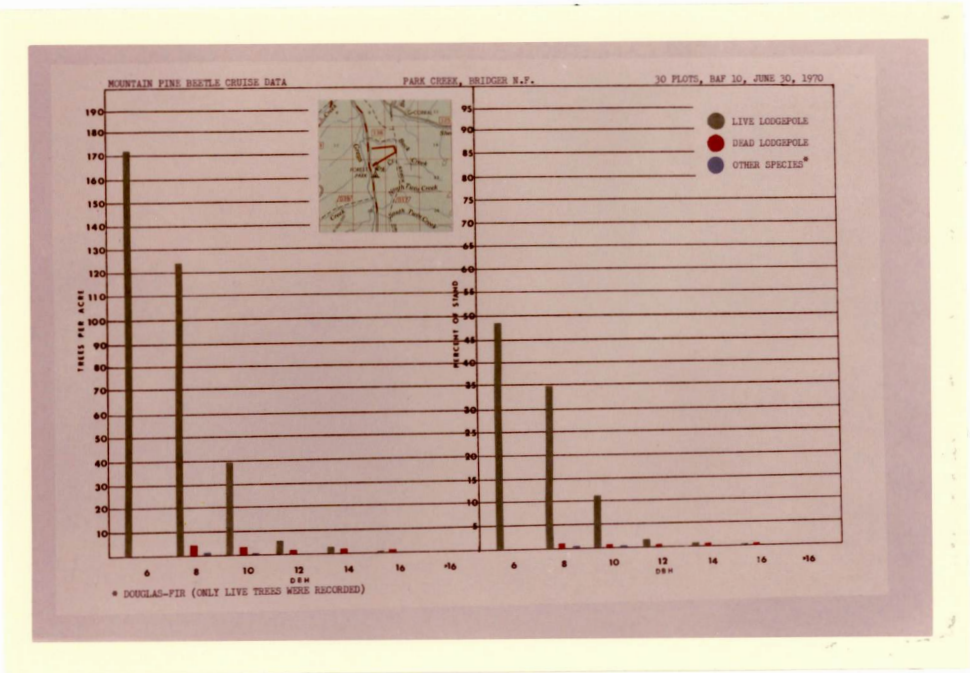

Figure 6 . Graphic and statistical presentation of stand structure in several areas on the Bridger National Forest, 1970.

Area		Diameter Class (In.)	Trees Per Acre: Live Lpp. (No.)	Live Lpp. (%)[1]	Dead Lpp. (No.)	Dead Lpp. (%)[1]	Live Other[2] (No.)	Live Other[2] (%)[1]	Total All Spp. (No.)	Total All Spp. (%)[1]
Water Dog Lake		6	67.5	25.4	--	--	5.0	1.9	72.5	27.3
		8	79.8	30.0	5.0	1.9	2.8	1.1	87.6	33.0
Basal Area/Acre ($Ft.^2$)		10	72.9	27.4	3.0	1.1	3.6	1.4	79.5	29.9
Live Lpp.	105.0	12	17.4	6.5	--	--	--	--	17.4	6.5
Dead Lpp.	5.5									
Other Spp.[2]	5.5	14	5.0	1.9	0.5	0.2	--	--	5.5	2.1
Total	116.0	16	2.0	0.7	0.4	0.1	--	--	2.4	0.8
		>16	0.3	0.1	--	--	0.9	0.3	1.2	0.4
SE %[3]	7.5									
Total			244.9	92.0	8.9	3.4	12.3	4.7	266.1	100.0

1/ Percent of total stand
2/ Douglas-fir
3/ One standard deviation